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Determination of *in vitro* activity of 4-Phenyl-1-(2-phenyl-allyl)-pyridinium bromide as a potential antibacterial agent

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The continuing increase in the incidence of multi drug resistant pathogenic bacteria and the shortage of new antimicrobial agents are the prime drivers in efforts to identify the novel antimicrobial classes. It is essential to synthesize novel drugs and evaluate their antimicrobial properties. The present study mainly focused on the screening of the antibacterial activity of 4-Phenyl-1-(2-phenyl-allyl) pyridinium bromide (4-PPPB).

4-PPPB was synthesized according to a previously published procedure. First, 4-phenylpyridine was synthesized by reacting activated pyridine with phenylmagnesium bromide and then it was reacted with 3-bromo-2-phenylpropene in order to obtain 4-PPPB. Evaluation of the *in vitro* antibacterial property of above compound was carried out against *Staphylococcus aureus*, *Streptococcus* species, *Bacillus subtilis*, *Klebsiella aerogenes* and *Escherichia coli* using disc diffusion method. *S. aureus* was selected to determine the Minimum Inhibitory Concentration (MIC). Antibacterial activity of 4-PPPB was compared using the disc diffusion method with penicillin, cloxacillin, erythromycin and vancomycin, which are given to cure *S. aureus* infections.

A strong inhibitory effect was observed on *S. aureus* while *E. coli* showed very little sensitivity towards the compound. The MIC of 4-PPPB for *S. aureus* was found to be ≤ 20 μg mL^{-1}. According to the free diffusion model, MIC of the compound was 4.89 μg mL^{-1} and according to the dissipative diffusion model, it was 0.15 μg mL^{-1}. However better linearity was achieved from the dissipative diffusion model. Therefore diffusion of 4-PPPB in the solid agar medium can be considered as a dissipative process and dissipative diffusion model is the best suited model for the determination of MIC. According to the antibacterial comparison results, cloxacillin showed the highest antibacterial activity at the highest concentrations (2500 μg mL^{-1}, 500 μg mL^{-1}) but 4-PPPB was the only antibacterial compound which was able to inhibit *S. aureus* at lower concentrations around 20 μg mL^{-1}.

Although the uptake mechanism of this compound by bacterial cells or toxicity of this compound is still unknown, it can be concluded that there is a possibility to use 4-PPPB as an effective antibacterial agent against *S. aureus*. The same analysis was carried out for the acridine based compound 9-phenylacridinium chloride (9-PAC).

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